

CLAIMS:

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent is:

1. A cooling apparatus comprising:

fan means for creating an air flow including a plurality of disk fan elements spaced apart in a stack configuration and adapted for rotation to create said air flow;

multiple heat sink means surrounding said plurality of disk fan elements;

a heat distribution block for receiving heat generated from a heat generating device;

a plurality of heat pipe elements communicating with said heat distribution block and said multiple heat sinks, said heat distribution block and heat pipe elements transferring heat from a heat generating device for distribution to said heat sinks;

wherein said plurality of disk fan elements are rotated to create an efficient, less turbulent air flow in an outward direction such that heat is uniformly eliminated from said surrounding multiple heat sink means.

2. The apparatus as claimed in Claim 1, further comprising a motor drive means for rotating said plurality of ring shaped disk fan elements, said motor drive means including a shaft means for mounting said plurality of disk fan elements in said stack configuration, said shaft means being rotated by said motor drive means.

3. The apparatus as claimed in Claim 2, further comprising at least one radial element located in spaced apart relation on each disk fan element and positioned between adjacent disk fan elements to form air gaps between said disk fan elements to enable less turbulent air flow as said disk fan elements of said fan means rotate.

4. The apparatus as claimed in Claim 3, wherein said at least one radial element is aerodynamic and comprises a rounded shape.

5. The apparatus as claimed in Claim 3, wherein said at lest one radial element is aerodynamic and comprises an elliptic shape.
6. The apparatus as claimed in Claim 3, wherein said shaft means comprises a hollow shaft, said motor drive means being integrated in the shaft means.
7. The apparatus as claimed in Claim 6, further comprising a plurality of slots located along a length of said hollow shaft for permitting air to pass through the shaft as said shaft rotates and exit said formed air gaps.
8. The apparatus as claimed in Claim 2, wherein each said multiple heat sink means is positioned to surround said plurality of disk fan elements.
9. The apparatus as claimed in Claim 2, wherein each said disk fan element is flat and stacked in a parallel configuration.
10. The apparatus as claimed in Claim 2, wherein each said disk fan element is corrugated and locations of each said corrugated disk fan element are connected to complementary locations of an adjacent corrugated disk fan element to provide air gaps between said corrugated disk fan elements to enable less turbulent air flow when rotated.
11. The apparatus as claimed in Claim 2, wherein said connected corrugated disk fan elements create a conic shaped air gap.
12. The apparatus as claimed in Claim 2, further comprising a heat transfer means for transferring additional heat from said heat distribution block to one or more of said plurality of disk fan elements.
13. The apparatus as claimed in Claim 12, wherein said heat transfer means comprises:

a fixed outer casing mounted near said motor drive means;

one or more first heat pipe means connecting said heat distribution block with said fixed outer casing for distributing heat generated from said heat generating device to the outer casing;

an inner rotational part coaxially located within said fixed outer casing, said inner rotational part mounted on said motor drive means and adapted for rotation therewith such that said rotational part freely rotates within the fixed outer casing;

means for conducting heat from said fixed outer casing to said inner rotational part and,

one or more second heat pipe means mounted in said inner rotational part and connected with said one or more of said plurality of disk fan elements for rotation therewith, said heat pipe means for conducting heat from said inner rotational part to said one or more of said plurality of disk fan elements.

14. The apparatus as claimed in Claim 13, wherein an outer surface of said inner rotational part is separated from the inner surface of the fixed outer casing by a narrow gap, said means for conducting heat from said fixed outer casing to said inner rotational part comprising a fluid coupling layer provided in said gap.

15. A cooling apparatus comprising:

fan means for creating an air flow including a plurality of disk fan elements spaced apart in a stack configuration and adapted for rotation to create said air flow;

multiple heat sink means surrounding said plurality of disk fan elements;

a heat distribution block for receiving heat generated from a heat generating device;

a plurality of heat pipe elements communicating with said heat distribution block and said multiple heat sinks, said heat distribution block and heat pipe elements transferring heat from a heat generating device for distribution to said heat sinks; and,

heat transfer means for transferring additional heat from said heat distribution block to one or more of said plurality of disk fan elements,

wherein said plurality of disk fan elements are rotated to create efficient, less

turbulent air flow in an outward direction such that heat is uniformly eliminated from said surrounding multiple heat sink means.

16. The cooling apparatus as claimed in Claim 15, further comprising a motor drive means for rotating said plurality of disk fan elements, said motor drive means including a shaft means for mounting said plurality of disk fan elements in said stack configuration, said shaft means being rotated by said motor drive means.

17. The cooling apparatus as claimed in Claim 16, further comprising one or more radial elements located in spaced apart relation on each disk fan element and positioned between adjacent disk fan elements to form air gaps between said disk fan elements to enable less turbulent air flow as said disk fan elements of said fan means rotate.

18. The cooling apparatus as claimed in Claim 17, wherein said shaft means comprises a hollow shaft, said motor drive means being integrated in the shaft means.

19. The cooling apparatus as claimed in Claim 18, further comprising a plurality of slots located along a length of said hollow shaft for permitting air to pass through the shaft as said shaft rotates and exit said formed air gaps.

20. The cooling apparatus as claimed in Claim 16, wherein each said multiple heat sink means is positioned to surround said plurality of disk fan elements.

21. The cooling apparatus as claimed in Claim 16, wherein each said disk fan element is flat and stacked in a parallel configuration.

22. The cooling apparatus as claimed in Claim 16, wherein each said disk fan element is corrugated and locations of each said corrugated disk fan element is attached to a corresponding location of an adjacent corrugated disk fan element to provide air gaps between said corrugated disk fan elements to enable less turbulent air flow.

23. The cooling apparatus as claimed in Claim 15, wherein said heat transfer means comprises:

a fixed outer casing mounted near said motor drive means;

one or more first heat pipe means connecting said heat distribution block with said fixed outer casing for distributing heat generated from said heat generating device to the outer casing;

an inner rotational part coaxially located within said fixed outer casing, said inner rotational part mounted on said motor drive means and adapted for rotation therewith such that said rotational part freely rotates within the fixed outer casing;

means for conducting heat from said fixed outer casing to said inner rotational part and,

one or more second heat pipe means mounted in said inner rotational part and connected with said one or more of said plurality of disk fan elements for rotation therewith, said heat pipe means for conducting heat from said inner rotational part to said one or more of said plurality of disk fan elements.

24. The cooling apparatus as claimed in Claim 23, wherein an outer surface of said inner rotational part is separated from the inner surface of the fixed outer casing by a narrow gap, said means for conducting heat from said fixed outer casing to said inner rotational part comprising a fluid coupling layer provided in said gap.

25. A fan for a cooling apparatus, said cooling apparatus including a plurality of heat sinks for conducting heat away from heat generating devices, said fan comprising:

a hollow shaft adapted for rotation about an axis;

a plurality of disk fan elements mounted on said hollow shaft in spaced apart relation to form a stack having air gaps formed therein, said stack of disk fan elements being rotatable with said hollow shaft for creating an air flow;

a motor drive integrated in the shaft means for imparting rotation to said disk fan elements; and,

a plurality of slots located along a length of said hollow shaft for permitting air to

pass through the shaft as said shaft rotates and exit said formed air gaps,

wherein said plurality of disk fan elements are rotated to create efficient, less turbulent air flow in an outward direction such that heat is uniformly eliminated from said plurality of heat sinks.

26. The fan for a cooling apparatus as claimed in Claim 25, wherein said fan is located coaxially with respect to said plurality of heat sinks, said plurality of heat sinks surrounding said stack of disk fan elements.

27. The fan for a cooling apparatus as claimed in Claim 25, further comprising at least one radial element located in spaced apart relation on each disk fan element and positioned between adjacent disk fan elements of said stack to form said air gaps between said disk fan elements to enable less turbulent air flow as said disk fan elements of said stack rotate.

28. The fan for a cooling apparatus as claimed in Claim 27, wherein said at least one radial element is aerodynamic and comprises one of: a rounded or elliptic shape.

29. The fan for a cooling apparatus as claimed in Claim 25, wherein each said disk fan element is flat and stacked in a parallel configuration.

30. The fan for a cooling apparatus as claimed in Claim 25, wherein each said disk fan element is corrugated and locations of each said corrugated disk fan element is connected to a complementary location of an adjacent corrugated disk fan element to provide air gaps between said corrugated disk fan elements to enable less turbulent air flow.

31. The fan for a cooling apparatus as claimed in Claim 30, wherein said connected corrugated disk fan elements create a conic shaped air gap.